

## Agilent 16380A Standard Air Capacitor Set

### Operation and Service Manual

#### MANUAL IDENTIFICATION

Model Number: 16380A Date Printed: March 2000 Part Number: 16380-90011
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This supplement contains information for correcting manual errors and for adapting the manual to newer instruments that contains improvements or modifications not documented in the existing manual.

To use this supplement

1. Make all ERRATA corrections
2. Make all appropriate serial-number-related changes listed below

SERIAL PREFIX OR NUMBER CHANGES	MAKE MANUAL
All	1

◆ New Item

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## ERRATA

## CHANGES 1

Change the company name from Hewlett-Packard or its abbreviation HP to Agilent Technologies.

CHANGE 1 contains the information needed to adapt the 16380A's manual.

### Page 1-6, Table 1-6. Other Supplemental Performance Characteristics

Change the Table 1-6 as follows.

MODEL CAPACITANCE	16381A 1 pF	16382A 10 pF	16383A 100 pF	16384A 1000 pF
Capacitance Stability <sup>1</sup>	≤ 300 ppm/year			
Capacitance Temperature Coefficient <sup>1</sup> (Typical)	+ 40 ppm/°C	+ 30 ppm/°C		
Maximum Allowable Voltage	±40V peak max. (AC + DC)			

<sup>1</sup>: at 1 kHz and 23°C ± 5°C

#### NOTE

Manual change supplement are revised as often as necessary to keep manuals as current and accurate as possible. Agilent Technologies recommends that you periodically request the latest edition of this supplement. Free copies are available from all Agilent Technologies offices. When requesting copies, quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.





**Agilent 16380A Standard Air Capacitor Set**

# **Operation and Service Manual**

**Third Edition**



**Agilent Technologies**

**Agilent Part No. 16380-90011**

**March 2000**

**Printed in Japan**

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## Manual Printing History

The manual's printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

April 1990	First Edition (part number: 16380-90001)
November 1998	Second Edition (part number: 16380-90011)
March 2000	Third Edition (part number: 16380-90011)

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Addresses are provided at the back of this manual.

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## GENERAL INFORMATION

### Introduction

This operation and service manual provides complete information on the HP 16380A Standard Air Capacitor Set. Figure 1-1 shows the HP 16380A, along with all furnished accessories.

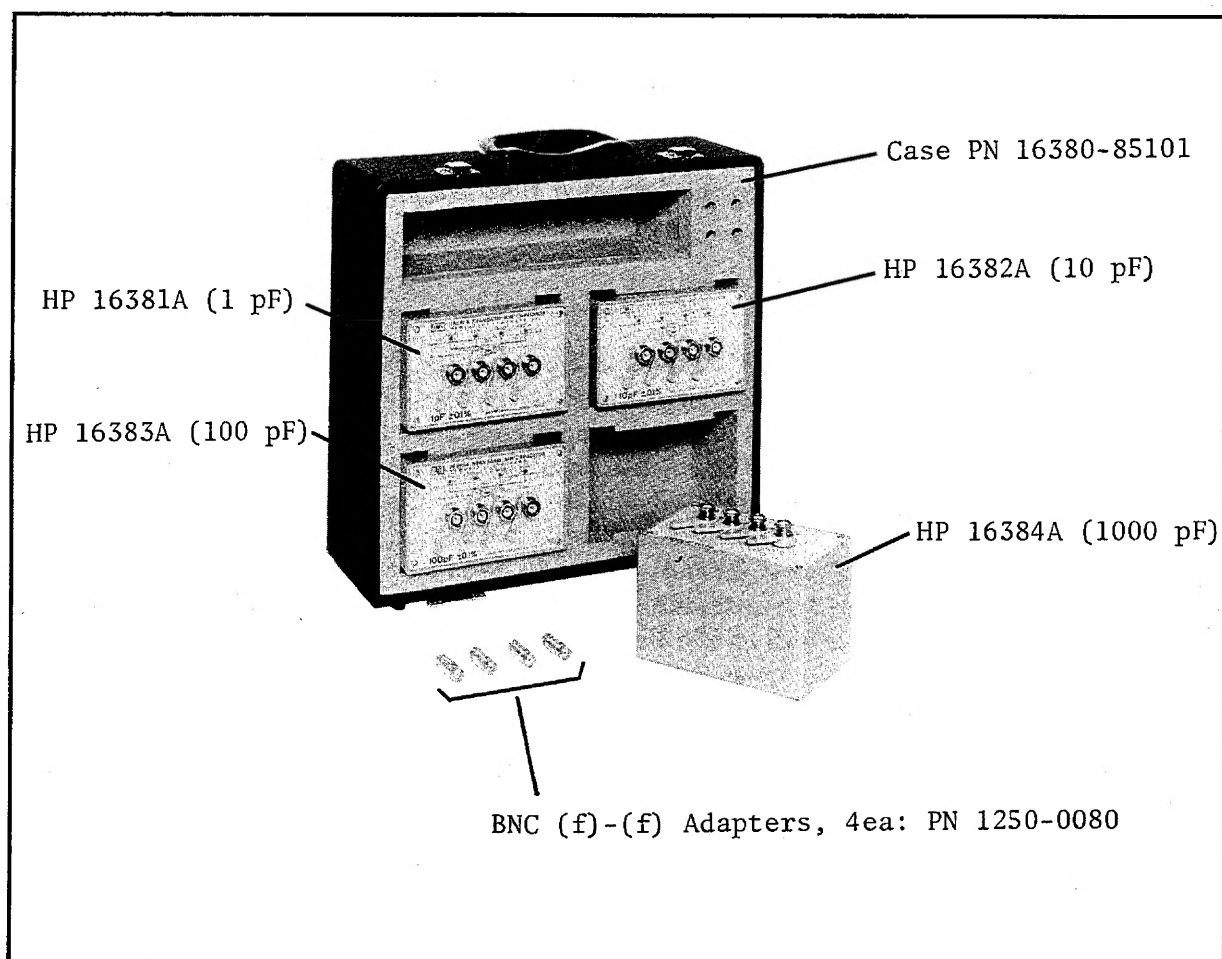


Figure 1-1. HP 16380A and Its Furnished Accessories

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## Description

The HP 16380A Standard Air Capacitor Set consists of four precision capacitors—1 pF (HP 16381A), 10 pF (HP 16382A), 100 pF (HP 16383A) and 1000 pF (HP 16384A). All four capacitors have high capacitance stability and are virtually unaffected by changes in environmental temperature, ensuring measurement repeatability and reliability.

The HP 16380A was designed for use in calibrating precision impedance measuring instruments (such as LCR meters, impedance analyzers, etc.) that have capacitance ranges between 1 pF and 1000 pF. The HP 16380A can be used to directly certify capacitance measurement accuracy over the 1 pF to 1000 pF range.

The HP 16380A can be connected directly to the measurement terminals of impedance measuring instruments that have the 4-terminal pair configuration. Other terminal configurations, such as 3-terminal and 5-terminal, can also be accommodated by using test leads and the furnished BNC adapters.

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## Initial Inspection

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically. The contents of the shipment should be as shown in Figure 1-1. If the shipment is incomplete, or if there is mechanical damage or defects, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement, without waiting for claim settlement.

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## Packaging

### Original Packaging

Containers and materials identical to those used in factory packaging are available from Hewlett-Packard. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the unit by model number and full serial number.



## Other Packaging

The following general instructions should be used for re-packing with commercially available materials:

- a. If shipping to Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number.
- b. Use a strong shipping container. A double-walled carton made of 350 pound test material is adequate.
- c. Use enough shock absorbing material (3- to 4-inch layer) around all sides of the case to provide a firm cushion and to prevent movement inside the container.
- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to ensure careful handling.
- f. In any correspondence, refer to the unit by model number and full serial number.

## Specifications

This section gives complete specifications for the HP 16380A Standard Air Capacitor Set. The specifications listed in Table 1-1 are the performance standards or limit against which the HP 16380A is tested. When the HP 16380A is shipped from the factory, it satisfies the specifications listed in Table 1-1. All accessories furnished with HP 16380A are listed in Table 1-3.

**Table 1-1. HP 16380A Specifications**

MODEL	HP 16381A	HP 16382A	HP 16383A	HP 16384A
Capacitance <sup>1</sup>	1 pF	10 pF	100 pF	1000 pF
Nominal Accuracy <sup>1</sup>	$\pm 0.1\%$			
Dissipation Factor <sup>1</sup>	$< 0.0001$			
Dimension <sup>2</sup>	142mm(W) x 88mm(D) x 112mm(H)			
Weight <sup>3</sup>	1.3 kg		1.4 kg	1.5 kg

- <sup>1</sup>: Specified at 1 kHz under ambient conditions: Temperature  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , Relative Humidity  $50\% \pm 20\%$
- <sup>2</sup>: Dimension of Carrying Case: approximately 360mm(W) x 370mm(D) x 190mm(H) (including dimensions of handle, buckle, and foot)
- <sup>3</sup>: Total Weight: approximately 8.0 kg (including four capacitance standards, a carrying case, and four BNC adapters)

## Operating Conditions

Table 1-2. Operating Conditions

Temperature	23°C ± 5°C
Relative Humidity	50% ± 20%

## Accessories furnished

Table 1-3. HP 16380A Furnished Accessories

Description	Qty.	Part Number
BNC(f)-(f) Adapter	4	PN 1250-0080
Carrying Case	1	PN 16380-85101
Operation and Service Manual	1	PN 16380-90001

## Supplemental Performance Characteristics

HP 16380A Supplemental Performance Characteristics are given in this section. The Supplemental Performance Characteristics are not specifications, but are typical characteristics included as additional information for the user.

### Capacitance Frequency Characteristics

The capacitance frequency characteristics of HP 16380A defined as four-terminal pair admittance standards are shown in Figure 1-2 and Figure 1-3.

The capacitance frequency characteristics represent the percent capacitance deviation from the calibrated capacitance value at a frequency of 1 kHz to the typical capacitance values at frequencies above 1 kHz.

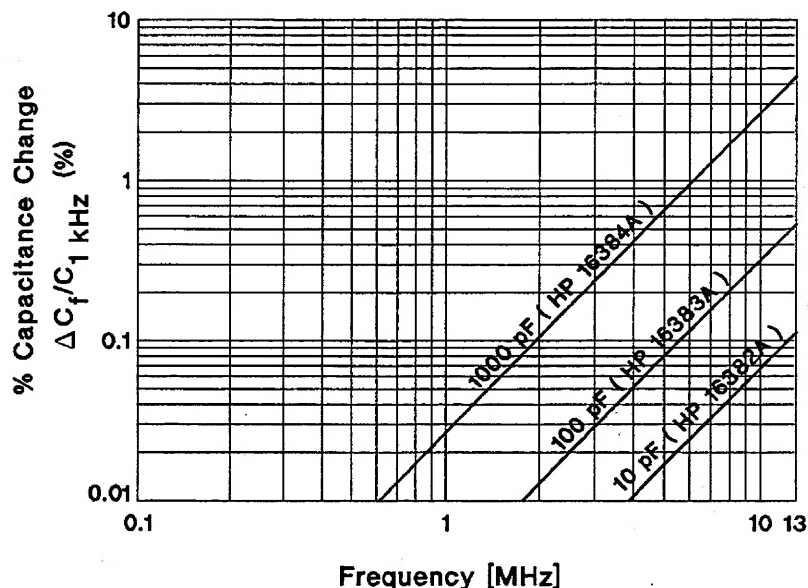
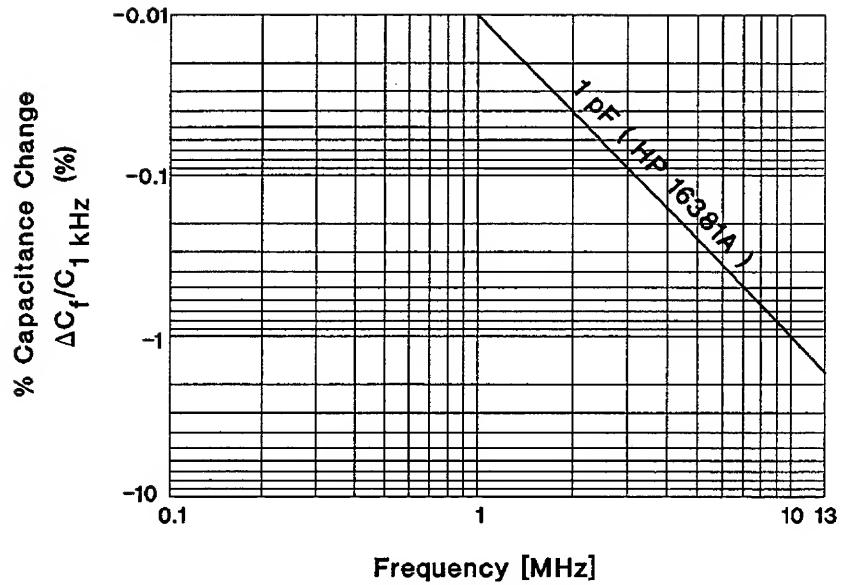


Figure 1-2. 10 pF, 100 pF, and 1000 pF Frequency Characteristics



**Figure 1-3. 1 pF Frequency Characteristics**

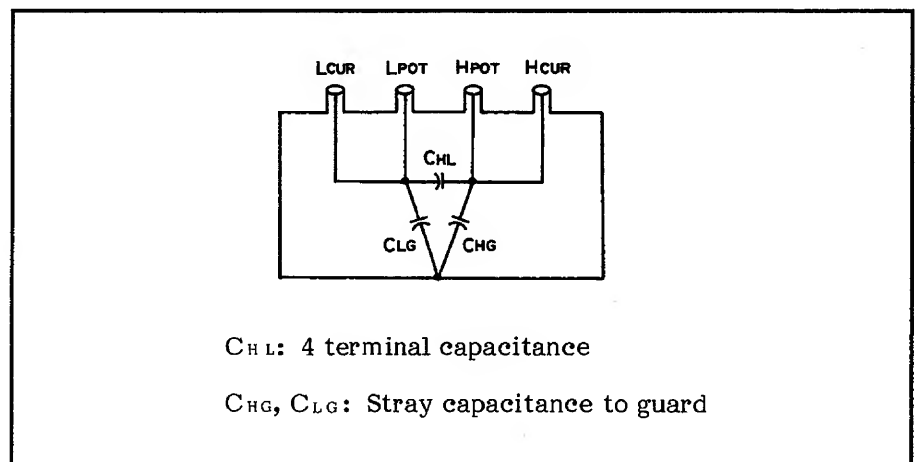
### Stray Capacitance to Guard

The typical stray capacitance to guard of the capacitance standards in the HP 16380A are listed in Table 1-4.

**Table 1-4. Stray Capacitance to Guard ( Typical )**

MODEL CAPACITANCE	HP 16381A 1 pF	HP 16382A 10 pF	HP 16383A 100 pF	HP 16384A 1000 pF
$C_{HG}^1$	17 pF	25 pF	31 pF	33 pF
$C_{LG}^1$	48 pF	29 pF	32 pF	34 pF

<sup>1</sup>: See Figure 1-4 below.



**Figure 1-4. Equivalent Circuit**

**Storage Environment**    The HP 16380A may be stored or shipped under the environmental conditions listed in Table 1-5.

**Table 1-5. Storage Condition**

Temperature	-15° C to +65° C
Relative Humidity	< 80%

The HP 16380A must be protected from temperature extremes which could cause condensation.

**Other Characteristics**    Other HP 16380A Supplemental Performance Characteristics are listed in Table 1-6.

**Table 1-6. Other Supplemental Performance Characteristics**

MODEL CAPACITANCE	HP 16381A 1 pF	HP 16382A 10 pF	HP 16383A 100 pF	HP 16384A 1000 pF
Capacitance Stability <sup>1</sup>	≤ 300 ppm/year			
Capacitance Temperature Coefficient <sup>1</sup> ( Typical )	+40 ppm/°C	+30 ppm/°C		
Maximum Allowable Voltage	700 V peak			

<sup>1</sup>:     at 1 kHz and 23°C ± 5°C

## **CALIBRATION AND REPAIR**

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### **Introduction**

This section provides the calibration and repair information for the HP 16380A Standard Air Capacitor Set.

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### **Calibration**

Hewlett-Packard will calibrate the HP 16380A. For complete information (price, time required, etc.) on how to have the HP 16380A calibrated, contact the nearest Hewlett-Packard Sales and Service Office

#### **Recommended Calibration Cycle**

The HP 16380A should be calibrated at least once a year. More frequent calibration may be required if the HP 16380A is used in very hot or very cold environments.

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### **Repair**

The HP 16380A contains no replaceable components. If one of the capacitors becomes damaged, or if its capacitance value is outside specified limits, the capacitor must be replaced. For complete information on service, contact the nearest Hewlett-Packard Sales and Service Office.



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